

**COMPACT BEDPLATE WITH INTEGRATED,  
ACCESSIBLE DEAD END HITCHES**

**BACKGROUND OF THE INVENTION**

5        This application relates to an elevator having its machine mounted on a bedplate and its dead end hitches extending vertically above a lowermost surface of the bedplate. Also, the dead end hitches are aligned in a space efficient manner.

      Elevators typically include an elevator car and a counterweight connected by several tension or connecting members such as ropes or belts. A machine drives the  
10    connecting members to move the counterweight and car through a hoistway.

      Historically, the machine was mounted in a room above the hoistway known as a machine room. This required a good deal of additional space. More recently elevators have been developed which incorporate the machine into the space between the car and an opposed wall. With such an arrangement, there is no  
15    machine room necessary. This type of elevator is generally known as a "machine roomless" elevator.

      In one known type of machine roomless elevator, the machine is mounted on a bedplate. The ends of the connecting members, or the "dead end hitches" are attached to the bottom of the bedplate. With this proposed arrangement, the dead  
20    end hitches are not easily accessible. Moreover, the arrangement of the dead end hitches is not as space efficient as would be desired.

**SUMMARY OF THE INVENTION**

      In a disclosed embodiment of this invention, dead end hitches are provided in  
25    a machine roomless elevator at a location above a lowermost point on the bedplate. In one embodiment, the dead end hitches are provided on top of the bedplate and next to the machine. In another embodiment, the dead end hitches are provided within an interior space in the bedplate. At either location, the dead end hitches are more easily accessible than in the prior art. Further, mounting the dead end hitches  
30    on the bedplate vertically above the lowermost point on the bedplate provides better space utilization, and also does not require numerous additional parts.

In a separate inventive feature, the dead end hitches are preferably aligned parallel to a rotational axis of the machine. There preferably are two aligned rows of dead end hitches, each defining a line parallel to the machine rotational axis. In this way, the tension or connecting members which are used to connect the counterweight to the car are less likely to twist, and space is more efficiently utilized.

In another inventive feature, a drive sheave for driving the connecting members has surfaces associated with each of the connecting members. The surfaces are axially aligned with associated dead end hitches at the ends of the particular connecting member. A line drawn through a sheave surface and its two associated dead end hitches is preferably perpendicular to the rotational axis of the machine.

These and other features of the present invention can be best understood from the following specification and drawings, the following of which is a brief description.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 schematically shows an elevator.

Figure 2 shows a portion of an elevator drive assembly.

Figure 3 is a top view showing the inventive bedplate.

Figure 4 is a partially schematic overhead view.

Figure 5A is a cross-sectional view through an inventive bedplate.

Figure 5B is a cross-sectional view through an inventive bedplate with an alternative dead end hitch

Figure 6 shows an alternative placement for a dead end hitch.

Figure 7 is a cross-sectional view showing another embodiment.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

An elevator 20 is illustrated in Figure 1 having an elevator car 22 movable through a hoistway. A machine 24 drives the car 22 in combination with a counterweight 28. The machine 24 is mounted on a bedplate 26. Bedplate 26 is mounted between a pair of spaced rails 42 for guiding the car 22, and another pair of

spaced rails 43 for guiding counterweight 28 (see Fig. 2). The rails 42 and 43 are typically provided by separate guide rail elements interconnected by connecting structures such as shown at 45. Integral, or one-piece rails, would also come within the scope of this invention. A sheave 30 associated with the machine 24 drives a  
5 connecting member such as a rope or belt 36 which also extends around a sheave 34 associated with the car 22 and another sheave 32 associated with the counterweight 28.

As known, opposed ends of the connecting member 36 are attached at dead end hitches 38 and 40. As is illustrated schematically in this view, the dead end  
10 hitches 38 and 40 are on an upper surface of the bedplate 26.

As shown in Figure 2, the rails 42 and 43 support the bedplate 26. As can be appreciated, while Figure 1 schematically shows a single connecting member 36, in practice, there may be several. The bedplate 26 supports the machine 24, sheave 30 having three sheave surfaces 30A, 30B, 30C to receive connecting members, and a  
15 speed governor 80. The sheave surfaces 30A, 30B and 30C may be grooves or other surfaces to receive the connecting members. Notably, bedplate 26 is preferably attached to all four guide rails 42 and 43.

Figure 3 is a perspective top view of the bedplate 26, omitting the machine. The embodiment illustrated in Figure 3 shows three spaced dead end hitches 38A, 38B, 38C for attaching one end of each of three connecting members 36 and three  
20 other dead end hitches 40A, 40B and 40C for the opposed ends of the connecting members. As can be appreciated from this figure, a spacer element 100 extends the dead end hitches 40A, 40B and 40C vertically above the vertical location of the dead end hitches 38A, 38B and 38C. The spacer element 100 preferably moves the  
25 dead end hitches 40A, 40B, 40C most remote from the car to a vertically upward position. The machine 24 and the sheave 30 are positioned between the dead end hitches 40A, 40B and 40C and the hoistway. Thus, the dead end hitches 40A, 40B, and 40C are somewhat less accessible than the dead end hitches 38A, 38B and 38C. The spacer element 100, which moves the dead end hitches 40A, 40B and 40C  
30 vertically upwardly increases the accessibility.

The structure of the dead end hitches is generally as known, and thus is not specifically detailed within this application. As generally known, ends of the

connecting member are held at a termination, which would be below the bedplate 26 in this figure. A rod extends from the termination upwardly to the dead end hitches. The hitch can be provided by either a spring, a rubber block or other resilient member. Generally, these features of the invention are as known in the prior art.

5 As also shown in Figure 3, the bedplate is formed of two opposed C-shaped cross-section beams 46 and 48. End plates 50 connect the ends of the beams 46 and 48.

As shown in Figure 4, a top view of the bedplate 26 shows there is a space 104 between the two C-shaped beams 46 and 48. As shown in this figure, the dead end hitches 40A, 40B and 40C are aligned into a row extending along a line B, whereas the dead end hitches 38A, 38B and 38C are aligned into a row extending along a line A. The lines A and B are parallel to each other, and are also parallel to a rotational axis of the sheaves 30 and sheave surfaces 30A, 30B and 30C. In this manner, the connecting members are less likely to twist than has been the case in the prior art, wherein the axes of the dead end hitches and the sheaves may sometimes be positioned skew relative to each other. Moreover, space is more efficiently utilized. As shown in this figure, the dead end hitches are positioned axially aligned with respective sheave surfaces 30A, 30B, 30C. Stated another way, an axial distance could be defined between the motor portion 107 and the axially most distant end of the sheave 30. As illustrated here, each of the dead end hitches 38A, 38B, 38C, 40A, 40B, and 40C are within this axial distance. Moreover, one of the dead end hitches 38 is preferably axially aligned with one of the sheave 30 surfaces and one of the dead end hitches 40. Preferably, there are three such aligned groups as illustrated in Figure 4. A line drawn through each group is perpendicular to the rotational axis of the sheave 30. In this manner, the space above the bedplate is more efficiently utilized. As can be appreciated from Figure 4, the machine 24 has an enlarged motor portion 107 and a spaced enlarged portion 108, which may be a brake and part of a bearing supporting the drive shaft for driving sheave 30. The outer diameters of the sheave is not as large as the elements 107 or 108. Thus, positioning the dead end hitches 38A, 38B and 38C, and 40A, 40B and 40C at positions axially aligned with the sheave provides better space utilization. Also, governor 80 is supported on the bedplate.

The above features are particularly valuable when the connecting member utilized is a so-called "flat rope." In elevators utilizing such connecting members, the specifically mentioned arrangements of the dead end hitches relative to the sheave surfaces provide benefits in preventing twisting, etc.

5        In the most preferred embodiment, both the parallel lines A and B, and the axial alignment of each sheave surface and its associated dead end hitches are combined. However, the features may also be utilized independent of each other. As an example, the axial alignment of the sheave surface and its associated dead end hitches relative to the rotational axis of the sheave may be utilized without the  
10       parallel alignment along lines A and B. The dead end hitches could be instead staggered relative to each other, etc. Further, it is also possible that there could be sheaves on each side of the machine associated with respective connecting members. Here again, both the "parallel" and "perpendicular" features as mentioned above could be incorporated to provide the mentioned benefits.

15       As shown in Figure 5 A, the dead end hitches 40 (and the other dead end hitches 38, not illustrated) are positioned atop a top wall 66 of the beam 46. As shown, the C-shape is provided by inwardly extending flanges 60 and 62 creating an internal space 64. Since the dead end hitch is positioned above the uppermost surface 66 of the bedplate 26, the dead end hitch is easily accessible for servicing.  
20       In the prior art, the proposed dead end hitches mounted to a bedplate have been positioned beneath the bedplate, and would be less easily accessible.

As shown schematically, and as known, a dead end hitch includes a portion 110 such as a rubber block, or spring, receiving a rod 112 that extends to a termination 114. The termination 114 secures connecting member 36 to the rod 112.  
25       As can be appreciated from Figure 5A, the rod extends through holes 116 and 118 in the beam 46.

Figure 5B shows a similar arrangement for dead end hitch 40, but wherein a spacer element 100 positions the block 110 somewhat vertically higher than in the Figure 5A embodiment. Again, while a rubber block 110 is illustrated, a worker in  
30       this art recognizes that other forms of dead end hitches may be utilized, and would come within the scope of this invention.

Figure 6 shows another embodiment wherein the dead end hitch 40 is mounted within the space 64. While this embodiment may be somewhat less accessible, it does provide good space utilization, and at the same time additional protection for the dead end hitch. The hitch is shown schematically.

5        Figure 7 shows an embodiment wherein a bedplate arrangement 130 includes a pair of spaced side portions 132 and 134 supporting the hitches 40 and 38. As shown, central plate portions 136 extend from each side portion 132 and 134. The sheave 30 has the connecting member 36 extending through openings 138 and 140 in the central plate portions 136. The central plate portions meet at a butt welded  
10       joint 150. Openings 142 are formed in side portions 132 and 134. End plates and stiffeners may be used to provide structural integrity.

It should also be understood that while specific bedplate structures have been illustrated, many other bedplate shapes and arrangements would come within the scope of this invention. As an example, the bedplate may simply be a flat plate.

15       Further, while each of the dead end hitch embodiments are shown mounted to the bedplate, a dead end hitch mounted vertically above the bedplate, but not connected to the bedplate, may also come within the scope of this invention.

Although preferred embodiments of this invention has been disclosed, a worker of ordinary skill in this art would recognize that modifications would come  
20       within the scope of this invention. For that reason, the following claims should be studied to determine the true scope and content of this invention.